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TITLE : NONMAGNETIC SPRING PARTS

ABSTRACT : PURPOSE: To obtain nonmagnetic spring parts for a magnetic head and a cassette tape by using an amorphous nonmagnetic alloy or an alloy prepd. by adding a specified amount of one or more among Nb, Al, Ti, V and Be to an Ni-Cr alloy or nonmagnetic steel.

CONSTITUTION: Nonmagnetic spring parts are made of an amorphous nonmagnetic alloy or an alloy prepd. by adding 0.1~15wt% in total of one or more among Nb, Al, Ti, V and Be to an Ni-Cr alloy or nonmagnetic steel. The components of said alloy are melted, and the melt is hot worked, rolled, and subjected to soln. heat treatment. The resulting material is formed into parts and age-hardened by heating at 400~800°C for 1~50hr to manufacture nonmagnetic spring parts.

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Japanese Unexamined Patent Application Publication No. 59-123747

# SPECIFICATION

1. Title of the Invention: NONMAGNETIC SPRING PART

2. Claims

(1) A nonmagnetic spring part for a magnetic head or a cassette tape formed with an alloy or a nonmagnetic amorphous alloy in which one or more selected from the group consisting of Nb, Al, Ti, V, and Be are added in a total amount of from 0.1 to 15% by weight to a Ni-Cr alloy or to a nonmagnetic steel.

(2) A nonmagnetic spring part for a magnetic head or a cassette tape according to claim 1, wherein the nonmagnetic steel is a Ni-Cr type nonmagnetic steel.

(3) A nonmagnetic spring part for a magnetic head according to claim 1 or claim 2, wherein the nonmagnetic spring part for the magnetic head is a core pressing spring.

(4) A nonmagnetic spring part for a cassette tape according to claim 1 or claim 2, wherein the nonmagnetic spring part for the cassette tape is a reel pressing spring for a video cassette tape.

3. Detailed Description of the Invention

[Technical Field of the Invention]

The present invention relates to a nonmagnetic spring part

desirable for use in a magnetic head or in a cassette tape.

[Description of the Related Art and Problems to be Solved by the Invention]

In recent years, remarkable progress has been developed in the field of magnetic recording. Since this development has been rapid, investigation on individual parts of the products used as functional parts has remained somewhat insufficient.

For example, sufficient springiness as well as sufficient nonmagnetism is required for a spring part formed by stacking thin plates made of a Ni-Fe alloy for pressing a core to prevent it from being displaced. However, those formed with a conventional Be-Cu alloy have defects that the Be-Cu alloy is expensive, that the alloy is insufficient in its strength, and that it tends to be set in fatigue if the post treatment includes a step in which it is subjected to such a high temperature as that in glass bonding. Furthermore, there is a hygienic problem since poisonous Be is used.

Besides, while a remarkable uniformity is required for a reel pressing spring for a video cassette tape, those made of a prior-art stainless steel is insufficient in strength, and also lacks in uniformity.

Furthermore, most of spring parts having sufficient springiness which are generally used do not satisfy the requirement of nonmagnetism, and, therefore, cannot be used for a magnetic head or for a cassette tape.

[Object of the Invention]

The present invention has been realized to cope with such problems, and aims at providing a nonmagnetic spring part for a magnetic head or a cassette tape, which has sufficient springiness, is inexpensive, and has little poison problem.

[Summary of the Invention]

Thus, the nonmagnetic spring part according to the present invention is formed with an alloy or a nonmagnetic amorphous alloy obtained by adding one or more selected from the group consisting of Nb, Al, Ti, V, and Be in a total amount of from 0.1 to 15% by weight to a Ni-Cr alloy or to a nonmagnetic steel.

As a nonmagnetic steel constituting the main material for the spring part according to the present invention, enumerated are a Mn-Cr steel represented by 18%Mn-5%Cr-Fe, a Mn-Cr-Ni steel represented by 9%Mn-18%Cr-6%Ni-Fe, a Ni-Cr steel represented by 16%Cr-14%Ni-Fe, etc. A Ni-Cr alloy which does not contain Fe can be also used. Particularly, if corrosion resistance, cost and productivity are considered, a Ni-Cr nonmagnetic steel is the most favorable from the industrial viewpoint.

As a metal to be added to these main materials, enumerated are Nb, Al, Ti, V, Be, etc. The amount of the metals to be added is set to be in the range of from 0.1 to 15% by weight in total. It is preferably in the range of from 0.1 to 10% by weight in total. It is noted that the amount is preferably 10% by weight or less for Nb or V, 5% by weight or less for Al or Ti, and 1% by weight or less for Be. The reason for limiting the amounts for addition as described above is that working becomes extremely difficult above the ranges, and that it is desirable

to use as small an amount as possible in the case of highly poisonous Be.

According to the present invention, it is also possible to form a nonmagnetic spring part with a nonmagnetic amorphous alloy. In this case, it is particularly preferable to use it for a reel pressing spring for a video cassette tape.

The nonmagnetic spring part according to the present invention is manufactured as follows, for example.

Alloy components are melted and hot-worked, then subjected to rolling, solution treatment, and fabrication. After that, the nonmagnetic spring part is formed by age hardening through heating at 400 to 800 °C for 1 to 50 hours.

[Examples]

Examples relating to the present invention are explained below.

Alloys shown in the table were melted, hot-worked, and then subjected to rolling. They were then subjected to solution treatment, light cold working, bending, and age hardening in this order to form a core pressing spring with a thickness of 0.25 mm and having a C shape. Also, blanking was executed instead of the bending, followed by age hardening to form a reel pressing spring for a video cassette tape with a thickness of 0.15 mm.

When cores were pressed by the core pressing springs thus formed, the displacements of the cores were as shown in the table. Defective rates of the reel pressing springs for

a video cassette tape are also as shown in the table. To be noted is that the comparative example in the table represents the cases wherein a conventional core pressing spring made of 2%Be-Cu alloy and a conventional reel pressing spring for a video cassette tape made of 18%Cr-11%Ni-Fe alloy were used.

		Core pressing spring/ Displacement of core (mm)	Reel pressing spring for a video cassette tape/Uniformity (Defective rate)
Working Example	20Ni-20Cr-3Ti-2Al-Fe alloy	0.008	0.01
	20Ni-20Cr-5Nb-1Ti-Fe alloy	0.009	0.012
	18Ni-16Cr-2V-1Be-Fe alloy	0.011	0.011
	Nonmagnetic amorphous alloy	0.05	0.011
Comparative Example	2Be-Cu alloy	0.1	-
	18Cr-11Ni-Fe alloy	-	0.8

[Advantages]

As explained above, the nonmagnetic spring part according to the present invention allowed only a small core displacement, was excellent in springiness, and when used as a reel pressing spring for a video cassette tape, it

provided excellent uniformity with a small defective rate.

Furthermore, since the nonmagnetic spring part according to the present invention fully satisfies the springiness required in relation to the future trend for miniaturization and lighter weight of magnetic recording parts, it will contribute to the miniaturization and lighter weight of magnetic recording products to a great extent.

AMENDMENT(VOLUNTARY)

1. Application No. 57-227218

6. Content of the Amendment

(1) The claims recited at page 1 is amended as shown in the attached paper.

(2) At page 3, lines 11 to 15, delete "is formed with an alloy or a nonmagnetic amorphous alloy obtained by adding one or more selected from the group consisting of Nb, Al, Ti, V, and Be in a total amount of from 0.1 to 15% by weight to a Ni-Cr alloy or to a nonmagnetic steel.", and insert the following.

REMARKS

"is formed with a Ni-Cr alloy, a nonmagnetic metal, or a nonmagnetic amorphous metal."

(3) After the part "is the most favorable from the industrial viewpoint." at page 4, line 4, insert the following.

REMARKS

"These materials are also effective for a gimbal member of a floppy head and a flexure for a Winchester head. Furthermore, they are effective for a shutter member of a compact floppy disk since it requires nonmagnetism and high strength. A gimbal member is a holding member having springiness for contacting a head to a floppy disk. A flexure is also a head holding member for holding a head at a constant distance from the hard disk."



(4) After the part "produced by (age) hardening." at page 5, line 3, insert the following.

REMARKS

"The material is also effective for a dummy member for a head core formed with a material with good abrasion resistance such as an Fe-Al-Si soft magnetic alloy , an amorphous alloy, or a ferrite. A dummy member is a member which has the same level of hardness as that of the core member, and is used to cover the peripheral part of the core of the head surface so that the abrasion resistance of the portions of the head surface other than the core is improved, when the head is contacted with a tape or the like."

[Claims]

- (1) A nonmagnetic spring part for magnetic recording formed with a nickel-chromium alloy, a nonmagnetic steel, or a nonmagnetic amorphous metal.
- (2) A nonmagnetic spring part according to claim 1, wherein the nonmagnetic steel comprises one or more selected from the group consisting of niobium, aluminum, titanium, vanadium, and beryllium.
- (3) A nonmagnetic spring part according to claim 2, wherein the total content of the one or more selected from the group consisting of niobium, aluminum, titanium, vanadium, and beryllium is from 0.1 to 15% by weight.
- (4) A nonmagnetic spring part according to one of claims 1 to 3, wherein the nonmagnetic steel is a nickel-chromium nonmagnetic steel.
- (5) A nonmagnetic spring part according to one of claims 1 to 4, wherein the nonmagnetic spring part is a core pressing spring for a magnetic head.
- (6) A nonmagnetic spring part according to one of claims 1 to 4, wherein the nonmagnetic spring part is a reel pressing spring for a video cassette tape.
- (7) A nonmagnetic spring part according to one of claims 1 to 4, wherein the nonmagnetic spring part is a gimbal member for a floppy disk head.
- (8) A nonmagnetic spring part according to one of claims 1 to 4, wherein the nonmagnetic spring part is a shutter member for a floppy disk.
- (9) A nonmagnetic spring part according to one of claims 1 to 4,

wherein the nonmagnetic spring part is a dummy member for a magnetic head.

(10) A nonmagnetic spring part according to one of claims 1 to 4,  
wherein the nonmagnetic spring part is a flexure for a Winchester head.



さらにまた、一般に使用される十分なばね性を有するばね部品は、非磁性という条件を満たすものが少なく、磁気ヘッド用やカセットテープ用に使用することができなかった。

#### 〔発明の目的〕

本発明はこのような点に対処してなされたもので、十分なばね性を有する、安価で毒性問題の少ない磁気ヘッド用またはカセットテープ用非磁性ばね部品を提供することを目的とする。

#### 〔発明の概要〕

すなわち本発明の非磁性ばね部品は、Ni-Cr合金もしくは非磁性鋼に、Nb、Al、Ti、V、Beから選ばれた1種または2種以上を合計量で0.1～15重量%添加した合金、または非晶質非磁性合金で形成してなることを特徴とする。

本発明においてはばね部品の主材を構成する非磁性鋼としては、18%Mn-5%Cr-Feで代表されるMn-Cr系、9%Mn-18%Cr-6%Ni-Feで代表されるMn-Cr-Ni系、16%Cr-14%Ni-Feで代表されるNi

-Cr系等がある。またFeを含まないNi-Cr合金を使用することもできる。特に耐食性、コスト、製造性を考えるとNi-Cr系非磁性鋼が最も工業的に好ましい。

これらの主材に添加する金属としては、Nb、Al、Ti、V、Be等があげられる。これらの添加量は合計量で0.1～15重量%好ましくは0.1～10重量%とする。なおNbまたはVは10重量%以下、Al、Tiは5重量%以下、Beは1重量%以下となる量が好ましい。添加量をこのように限定した理由は、この範囲を越えると加工がきわめて困難となること及び毒性の高いBeはできるだけ減じようとすることによる。

また本発明においては、非晶質非磁性合金で非磁性ばね部品を形成してもよく、この場合は特にビデオカセットテープ用リール抑えばねとして使用するのが望ましい。

本発明の非磁性ばね部品は、例えば次のようにして製造される。

合金成分を溶解し熱間加工を施した後、圧延、

溶体化処理し、成形加工を施した後、400℃～800℃で1～50時間加熱することにより時効硬化して製造される。

#### 〔発明の実施例〕

次に本発明の実施例について説明する。

表に示す合金を溶解し、熱間加工した後、圧延した。次に溶体化処理を行ない、軽く冷間加工を行なった後、曲げ加工を施し時効硬化を行なって厚さ0.25mmのコの字形のコア抑えばねを製造した。また曲げ加工の代りに打抜き加工を行ない、時効硬化を行なって厚さ0.15mmのビデオカセットテープ用リール抑えばねを製造した。

このようにして製造されたコア抑えばねによりコアを抑えたところ、コアのずれは表に示す通りであった。またビデオカセットテープ用リール抑えばねの不良率は表に示す通りであった。なお表中の比較例は従来の2%Be-Cu合金からなるコア抑えばね、および18%Cr-11%Ni-Fe合金からなるビデオカセットテープ用リール抑えばねについての結果である。

		コア抑えばね コアのずれ (mm)	ビデオカセット テープ リール 抑えばね 均 一 性 (不良率)
実 施 例	20Ni-20Cr-3Ti-2Al-Fe合金	0.008	0.01
	20Ni-20Cr-5Nb-1Ti-Fe合金	0.009	0.012
	18Ni-16Cr-2V-1Be-Fe合金	0.011	0.011
	非晶質非磁性合金	0.05	0.011
比 較 例	2Be-Cu合金	0.1	—
	18Cr-11Ni-Fe合金	—	0.8

## 〔発明の効果〕

手続補正書(自発)

昭和 年 月 日  
58.5.23

特許庁長官 若杉和夫 殿

以上説明したように本発明の非磁性ばね部品はコアのずれが小さくてばね性に優れ、またビデオカセットテープ用リール抑えばねとして使用した場合も不良率が小さく均一性に優れたものであった。

また本発明の非磁性ばね部品は、磁気記録部品の今後の小型化、軽量化に伴って要求されるばね性を十分満足するものであるので、磁気記録製品の小型、軽量化に大きく寄与することになる。

代理人弁理士 則近憲佑  
(ほか1名)

## 1. 事件の表示

特願昭57-227218号

## 2. 発明の名称

非磁性ばね部品

## 3. 補正をする者

事件との関係 特許出願人  
(307) 東京芝浦電気株式会社

## 4. 代理人

〒100

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## 5. 補正命令の日付

昭和 年 月 日(発送日)

## 5. 補正の対象

明細書の特許請求の範囲の欄

明細書の発明の詳細な説明の欄

## 6. 補正の内容

- (1) 明細書第1頁に記載の特許請求の範囲を別紙のとおり訂正する。
- (2) 明細書第3頁第11行目乃至第15行目記載の「Ni-Cr合金」を特徴とする。」を下記の文章に改訂する。

記

「ニッケルクロム合金、非磁性金属又は非磁性非晶質金属で形成してなることを特徴とする。」

- (3) 明細書第4頁第4行目記載の「最も工業的に好ましい。」の次に下記の文章を挿入する。

記

「また、これらの材料はフロッピーヘッドのジンバル材やウインチエスター型ヘッドのフレキシャーとしても有効であるし、その他にも、コンパクトフロッピーディスクのシャッター材としても、非磁性及び高強度が要求されるので、有効である。ジンバル材はヘッドをフロッピーディスクに接触させる為のはね性を有する保持材であり、フレキシャーも、

ヘッドをハードディスクに対して一定の間隔を保持する為のヘッド保持材である。」

- (4) 明細書第5頁第3行目記載の「硬化して製造される。」の次に下記の文章を挿入する。

記

「また、本材料は、Fe-Al-Si軟磁性合金、非晶質合金、フェライトのような耐摩耗性の良い材料で形成されたヘッドコアに対するダミー材としても有効である。

ダミー材とは、コア材と同程度の硬度を有する材料であり、ヘッド表面上のコア周縁部をこの材料でおおうことにより、ヘッドがテープ等に接触した際、ヘッド表面上のコア以外の部分の摩耗性を向上させる為に使用される。」

以上

## 「特許請求の範囲」

- (1) ニッケルクロム合金、非磁性鋼又は非磁性非晶質金属で形成してなる磁気記録用の非磁性ばね部品。
- (2) 非磁性鋼は、ニオブ、アルミニウム、チタン、バナジウム、ベリリウムから選ばれた1種または2種以上を含有した特許請求の範囲第1項に記載の非磁性ばね部品。
- (3) ニオブ、アルミニウム、チタン、バナジウム、ベリリウムから選ばれた1種または2種以上の含有量は、合計で0.1～15重量%である特許請求の範囲第2項に記載の非磁性ばね部品。
- (4) 非磁性鋼は、ニッケルクロム系非磁性鋼である特許請求の範囲第1項乃至第3項に記載の非磁性ばね部品。
- (5) 非磁性ばね部品は磁気ヘッド用コア抑えばねである特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。
- (6) 非磁性ばね部品はビデオカセットテープ用

リール抑えばねである特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。

- (7) 非磁性ばね部品は、フロッピーディスク用ヘッドのジンバル材である特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。
- (8) 非磁性ばね部品は、フロッピーディスクのシャッター材である特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。
- (9) 非磁性ばね部品は、磁気ヘッドのダミー材である特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。
- (10) 非磁性ばね部品は、ウインチエスター型ヘッドのフレキシヤーである特許請求の範囲第1項乃至第4項に記載の非磁性ばね部品。」